REMARKS

By this Preliminary Amendment, applicant has added an Abstract of the Disclosure. The added abstract is supported by the abstract of the International Application to which the present national application claims priority. As required, a copy of the abstract is also attached hereto on a separate sheet of paper. The claims have also been amended to remove multiple dependencies and to place the claims into a more conventional format for U.S. prosecution. For the foregoing reasons, applicant respectfully submits that the amendments to the specification and the claims do not introduce new matter, and entry thereof is respectfully requested.

In view of the foregoing, claims 1-94 as amended herein are presented for the Examiner's consideration on the merits.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached pages are captioned VERSION WITH MARKINGS TO SHOW CHANGES MADE.

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Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

1. (Amended) A method of indicating pH levels in an animal, the method comprising:

a) obtaining measurements corresponding to [the] a body temperature of the animal at periodic sampling intervals;

b) applying an algorithm to the measurements obtained from a) which algorithm cumulatively takes account of variations in body temperature over time; and

c) comparing the results of the algorithm to a predetermined threshold.

2. (Amended) A method of indicating pH levels in an animal, the method comprising:

a) obtaining measurements corresponding to [the] a body temperature of the animal at periodic sampling intervals;

b) applying an algorithm to the measurements obtained from a) which algorithm cumulatively takes account of variations in body temperature over time; and

c) correlating the results of the algorithm with [the] a pH standard.

3. (Amended) The method as claimed in claim 1 [or claim 2] wherein ten or more measurements corresponding to body temperature are taken.

4. (Amended) The method as claimed in [any one of the preceding claims] claim 1 wherein the measurements are taken for a predetermined time period.

6. (Amended) The method as claimed in claim 4 [or claim 5] wherein the predetermined time period extends up to 24 hours.

7. (Amended) The method as claimed in [any one of the claims] claim 1 wherein the algorithm is applied at [the] a end of the predetermined time period.

9. (Amended) The method as claimed in [any one of claims 1 to 6] claim 1 wherein the algorithm is applied progressively.

11. (Amended) The method as claimed in claim 9 [or claim 10] wherein c) is conducted after each application of the algorithm.

12. (Amended) The method as claimed in [any one of the preceding claims] claim 1 wherein c) comprises comparing the results of the algorithm to a predetermined threshold and further, in the event of the threshold being exceeded, providing an indication of the threshold being exceeded.

14. (Amended) The method as claimed in [any one of claims 9 to 13] claim 9 wherein a mean is calculated progressively as each measurement corresponding to temperature is taken.

15. (Amended) The method as claimed in [any one of claims 9 to 13] claim 9 wherein the algorithm [is as follows] comprises:

where:

t_{ear} is the instantaneous ear temperature;

$t_{ambient}$ is the instantaneous ambient air temperature;

d is the difference between ear and ambient temperatures;

fast is the fast-response filter element;

slow is the slow response filter element;

v is the integral of the difference between the two filter elements;

c_1 is the time constant of the fast filter;

c_2 is the time constant of the slow filter;

Time constants are such that $c_1 > c_2$, $0 < c_1 < 1, 0 < c_2 < 1$;

where initially:

$n=1$

$d_0=t_{ear}-t_{ambient}$

$fast_0=d_0$

$slow_0=d_0$

$v_0=0$

and where at each sampling interval:

$d_n = t_{ear} - t_{ambient}$

$fast_n = (1-c_1)*fast_{n-1} + c_1*d_n$

$slow_n = (1-c_2)*slow_{n-1} + c_2*d_n$

then: $v_n = v_{n-1} + (fast_n-slow_n)$.

17. (Amended) The method as claimed in [any one of the preceding claims] claim 1 wherein the measurements are taken on the outer part of the animal's body.

18. (Amended) The method as claimed in claim 17 wherein skin temperature measurements are taken and compensation is provided for at least ambient temperature [and/]or solar radiation.

20. (Amended) A method of providing an indication of stress levels in an animal, the method comprising:

a) obtaining measurements corresponding to [the] a body temperature of the animal at periodic sampling intervals;

b) applying an algorithm to the measurements obtained from a) which algorithm cumulatively takes account of variations in body temperature over time; and

c) comparing the results of the algorithm to a predetermined threshold.

21. (Amended) A method of providing an indication of stress levels in an animal, the method comprising:

a) obtaining measurements corresponding to [the] a body temperature of the animal at periodic sampling intervals;

b) applying an algorithm to the measurements obtained from a) which algorithm cumulatively takes account of variations in body temperature over time; and

c) correlating the results of the algorithm with a stress standard.

22. (Amended) The method as claimed in claim 20 [or claim 21] wherein ten or more measurements corresponding to body temperature are taken.

23. (Amended) The method as claimed in [any one of claims 20 to 22] claim 20 wherein the measurements are taken for a predetermined time period.

25. (Amended) The method as claimed in claim 23 [or claim 24] wherein the predetermined time period extends up to 24 hours.

26. (Amended) The method as claimed in [any one of the claims 20 to 25] claim 20 wherein the algorithm is applied at the end of [the] a predetermined time period.

28. (Amended) The method as claimed in [any one of claims 20 to 25] claim 20 wherein the algorithm is applied progressively.

30. (Amended) The method as claimed in claim 28 [or claim 29] wherein c) is conducted after each application of the algorithm.

31. (Amended) The method as claimed in [any one of claims 20 to 30] claim 20 wherein c) comprises comparing the results of the algorithm to a predetermined threshold and further, in the event of the threshold being exceeded, providing an indication of the threshold being exceeded.

33. (Amended) The method as claimed in [any one of claims 28 to 32] claim 28 wherein a mean is calculated progressively as each measurement corresponding to temperature is taken.

34. (Amended) The method as claimed in [any one of claims 28 to 32] claim 28 wherein the algorithm [is as follows] comprises:

where:

t_{ear} is the instantaneous ear temperature;

$t_{ambient}$ is the instantaneous ambient air temperature;

d is the difference between ear and ambient temperatures;

fast is the fast-response filter element;

slow is the slow response filter element;

v is the integral of the difference between the two filter elements;

c_1 is the time constant of the fast filter;

c_2 is the time constant of the slow filter;

Time constants are such that $c_1 > c_2$, $0 < c_1 < 1, 0 < c_2 < 1$;

where initially:

$n=1$

$d_0 = t_{ear} - t_{ambient}$

$fast_0 = d_0$

$slow_0=d_0$

$v_0=0$

and where at each sampling interval:

$d_n = t_{ear} - t_{ambient}$

$fast_n = (1-c_1)*fast_{n-1} + c_1*d_n$

$slow_n = (1-c_2)*slow_{n-1} + c_2*d_n$

then: $v_n = v_{n-1} + (fast_n-slow_n)$.

35. (Amended) The method as claimed in [any one of claims 20 to 34] claim 20 wherein the measurements are taken on the outer part of the animal's body.

36. (Amended) The method as claimed in claim 35 wherein skin temperature measurements are taken and compensation is provided for at least ambient temperature [and/]or solar radiation.

38. (Amended) A method of measuring stress levels in an animal, the method comprising measuring the animal's pH level using a method of [any one of claims 1 to 19] claim 1, a pH level greater than 5.8 to 6.2 indicating a stressed animal.

39. (Amended) A method of providing an indication of meat quality in an animal, the method comprising:

a) obtaining measurements corresponding to [the] a body temperature of the animal at periodic sampling intervals;

b) applying an algorithm to the measurements obtained from a), which algorithm cumulatively takes account of variations in body temperature over time; and

c) comparing the results of the algorithm to a predetermined threshold.

40. (Amended) A method of providing an indication of meat quality in an animal, the method comprising:

a) obtaining measurements corresponding to [the] a body temperature of the animal at periodic sampling intervals;

b) applying an algorithm to the measurements obtained from a), which algorithm cumulatively takes account of variations in body temperature over time; and

c) correlating the results of the algorithm with a meat tenderness standard.

41. (Amended) The method as claimed in claim 39 [or claim 40] wherein ten or more measurements corresponding to body temperature are taken.

42. (Amended) The method as claimed in [any one of claims 39 to 41] claim 39 wherein the measurements are taken for a predetermined time period.

45. (Amended) The method as claimed in [any one of claims 39 to 44] claim 39 wherein the algorithm is applied at [the] a end of the predetermined time period.

47. (Amended) The method as claimed in [any one of claims 39 to 44] claim 39 wherein the algorithm is applied progressively.

49. (Amended) The method as claimed in claim 47 [or 48] wherein c) is conducted after each application of the algorithm.

50. (Amended) The method as claimed in [any one of claims 39 to 49] claim 39 wherein c) comprises comparing the results of the algorithm to a predetermined threshold and further, in the event of the threshold being exceeded, providing an indication of the threshold being exceeded.

52. (Amended) The method as claimed in [any one of claims 47 to 51] claim 47 wherein a mean is calculated progressively as each measurement corresponding to temperature is taken.

53. (Amended) The method as claimed in [any one of claims 47 to 51] claim 47 wherein the algorithm [is as follows] comprises:

where:

t_{ear} is the instantaneous ear temperature;

$t_{ambient}$ is the instantaneous ambient air temperature;

d is the difference between ear and ambient temperatures;

fast is the fast-response filter element;

slow is the slow response filter element;

v is the integral of the difference between the two filter elements;

c_1 is the time constant of the fast filter;

c_2 is the time constant of the slow filter;

Time constants are such that $c_1 > c_2$, $0 < c_1 < 1, 0 < c_2 < 1$;

where initially:

$n=1$

$d_0 = t_{ear} - t_{ambient}$

$fast_0 = d_0$

$slow_0 = d_0$

$v_0 = 0$

and where at each sampling interval:

$d_n = t_{ear} - t_{ambient}$

$fast_n = (1-c_1)*fast_{n-1} + c_1*d_n$

$slow_n = (1-c_2)*slow_{n-1} + c_2*d_n$

then: $v_n = v_{n-1} + (fast_n - slow_n)$.

54. (Amended) The method as claimed in [any one of claims 39 to 53] claim 39 wherein the measurements are taken on the outer part of the animal's body.

55. (Amended) The method as claimed in claim 54 wherein skin temperature measurements are taken and compensation is provided for at least ambient temperature [and/]or solar radiation.

57. (Amended) A system for providing an indication of meat quality in an animal to be slaughtered, the system [including] comprising:

a body mountable measurement device for obtaining measurements corresponding to the body temperature of the animal at periodic sampling intervals over a period of between 3-36 hours; and

a processor having [an] input means [to receive] for receiving the measurements from the measurement device, the processor operable to implement an algorithm to the measurements, which algorithm cumulatively takes account of variations in body temperature over time, wherein the processor has [an] output means for providing the result of the algorithm.

58. (Amended) The system as claimed in claim 57 wherein the algorithm [is as follows] comprises the following:

determine the animal's mean body temperature from the measurements;

calculate the variance between each measurement and the mean; and

add all variances to obtain a cumulative variance score.

59. (Amended) The system as claimed in claim 57 wherein the algorithm [is as follows] comprises the following:

where:

t_{ear} is the instantaneous ear temperature;

$t_{ambient}$ is the *instantaneous* ambient air temperature;

d is the *difference* between ear and ambient temperatures;

fast is the *fast*-response filter element;

slow is the slow *response* filter element;

v is the integral of *the* difference between the two filter elements;

c_1 is the time *constant* of the fast filter;

c_2 is the time *constant* of the slow filter;

Time constants are such that $c_1 > c_2$, $0 < c_1 < 1, 0 < c_2 < 1$;

where initially:

$n=1$

$d_0 = t_{ear} - t_{ambient}$

$fast_0 = d_0$

$slow_0 = d_0$

$v_0 = 0$

and where at each sampling interval:

$d_n = t_{ear} - t_{ambient}$

$fast_n = (1-c_1)*fast_{n-1} + c_1*d_n$

$slow_n = (1-c_2)*slow_{n-1} + c_2*d_n$

then: $v_n = v_{n-1} + (fast_n - slow_n)$.

60. (Amended) The system as claimed in [any one of claims 57 to 59] claim 57 wherein the system is embodied in an all-in-one indicator device.

63. (Amended) The system as claimed in [any one of claims 57 to 59] claim 57, wherein the processor is provided by way of a remote computer.

64. (Amended) The system as claimed in [any one of claims 57 to 63] claim 57 wherein the processor is adapted to output a numeric value from a comparison with a meat tenderness scale.

65. (Amended) The system as claimed in [any one of claims 57 to 63] claim 57 wherein the processor is operable to compare the output of the algorithm to a predetermined threshold.

68. (Amended) A system for indicating cumulative stress in an animal, the system [including] comprising:

a body mountable measurement device for obtaining measurements corresponding to outer body temperature of the animal at periodic time intervals over a period of between 3-6 hours; and

a processor having an input to receive measurements from the measurement device, the processor operable to implement an algorithm to the measurements, which algorithm cumulatively takes account of variations in body temperature over time, wherein the processor has an output for the result of the algorithm.

69. (Amended) The system as claimed in claim 68 wherein the algorithm [is as follows] comprises the following:

determine the animal's average body temperature from the measurements;

calculate the variance between each measurement and the average; and

add all variances to obtain a cumulative variance score.

70. (Amended) The system as claimed in claim 68 wherein the algorithm [is as follows] comprises the following:

where:

t_{ear} is the instantaneous ear temperature;

$t_{ambient}$ is the instantaneous ambient air temperature;

d is the difference between ear and ambient temperatures;

fast is the fast-response filter element;

slow is the slow response filter element;

v is the integral of the difference between the two filter elements;

c_1 is the time constant of the fast filter;

c_2 is the time constant of the slow filter;

Time constants are such that $c_1 > c_2$, $0 < c_1 < 1$, $0 < c_2 < 1$;

where initially:

$n=1$

$d_0 = t_{ear} - t_{ambient}$

$fast_0 = d_0$

$slow_0 = d_0$

$v_0 = 0$

and where at each sampling interval:

$d_n = t_{ear} - t_{ambient}$

$fast_n = (1-c_1)*fast_{n-1} + c_1*d_n$

$slow_n = (1-c_2)*slow_{n-1} + c_2*d_n$

then: $v_n = v_{n-1} + (fast_n - slow_n)$.

71. (Amended) The system as claimed in [any one of claims 68 to 70] claim 68 wherein the system is embodied in an all-in-one indicator device.

74. (Amended) The system as claimed in [any one of claims 68 to 70] claim 68 wherein the processor is provided by way of a remote computer.

75. (Amended) The system as claimed in [any one of claims 68 to 74] claim 68 wherein the processor is adapted to output a numeric value or comparison with a meat tenderness scale.

76. (Amended) The system as claimed in [any one of claims 68 to 74] claim 68 wherein the processor is operable to compare the output of the algorithm to a predetermined threshold.

79. (Amended) A system of indicating pH in an animal, the system [including] comprising:

a body mountable measurement device for obtaining measurements corresponding to outer body temperature of the animal at periodic time intervals over a period of between 3-6 hours; and

a processor having an input to receive measurements from the measurement device, the processor operable to implement an algorithm to the measurements, which algorithm cumulatively takes account of variations in body temperature over time, wherein the processor has an output for the result of the algorithm.

80. (Amended) The system as claimed in claim 79 wherein the algorithm [is as follows] comprises:

determine the animal's average body temperature from the measurements;

calculate the variance between each measurement and the average; and

add all variances to obtain a cumulative variance score.

81. (Amended) The system as claimed in claim 79 wherein the algorithm [is as follows] comprises:

where:

t_{ear} be the instantaneous ear temperature;

$t_{ambient}$ be the instantaneous ambient air temperature;

d is the difference between ear and ambient temperatures;

fast is the fast-response filter element;

slow is the slow response filter element;

v is the integral of the difference between the two filter elements;

c_1 is the time constant of the fast filter;

c_2 is the time constant of the slow filter;

Time constants are such that $c_1 > c_2$, $0 < c_1 < 1$, $0 < c_2 < 1$;

where initially:

$n=1$

$d_0 = t_{ear} - t_{ambient}$

$fast_0 = d_0$

$slow_0 = d_0$

$v_0 = 0$

and where at each sampling interval:

$d_n = t_{ear} - t_{ambient}$

$fast_n = (1-c_1)*fast_{n-1} + c_1*d_n$

$slow_n = (1-c_2)*slow_{n-1} + c_2*d_n$

then: $v_n = v_{n-1} + (fast_n - slow_n)$.

82. (Amended) The system as claimed in [any one of claims 79 to 81] claim 79 wherein the system is embodied in an all-in-one indicator device.

85. (Amended) The system as claimed in [any one of claims 70 to 81] claim 79 wherein the processor is provided by way of a remote computer.

86. (Amended) The system as claimed in [any one of claims 79 to 85] claim 79 wherein the processor is adapted to output a numeric value from a comparison with a meat tenderness scale.

87. (Amended) The system as claimed in [any one of claims 79 to 85] claim 79 wherein the processor is operable to compare the output of the algorithm to a predetermined threshold.

89. (Amended) A temperature sensing device [including] comprising:

a tag having an attachment portion to extend through a body part of an animal, the tag incorporating an indicator [means]; and

one or more animal temperature sensors disposed on/in the attachment portion for contact with the animal during use.

91. (Amended) The tag as claimed in claim 89 [or claim 90] wherein[,] an ambient temperature sensor is also provided on the tag.

92. (Amended) The tag as claimed in [any one of claims 89 to 91] claim 89 wherein [a] comparison means is provided [to compare] for comparing the ambient temperature with the animal temperature.

93. (Amended) The tag as claimed in claim 92 wherein [an] the indicator is disposed on the tag, the indicator being responsive to the comparison means.

94. (Amended) The tag as claimed in [any one of claims 89 to 93] claim 89 wherein the tag comprises a one piece mo[u]lded body.

ABSTRACT OF THE DISCLOSURE

A method of providing an indication of pH levels in an animal can alternatively be used to provide an indication of stress in an animal. Since pH and temperature are related to ultimate meat quality, the method of the invention may also be used to provide an indication of ultimate meat quality. In the method, periodic measurements are obtained corresponding to the body temperature of the animal. An algorithm is applied to the measurements obtained. The algorithm cumulatively takes account of variations of body temperature over time. The results of the algorithm are compared to a pre-determined threshold. Alternatively, the results of the algorithm may be compared with a standard to provide a quantitative indication of pH, stress or meat tenderness. A system for providing an indication of meat quality/stress levels or pH levels in an animal is also provided.